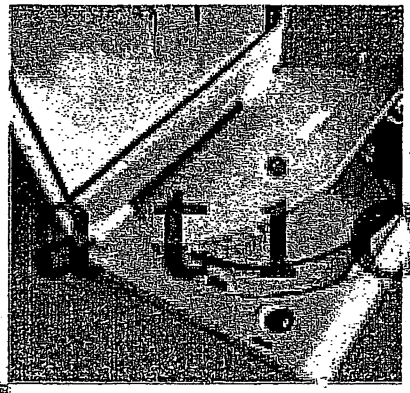
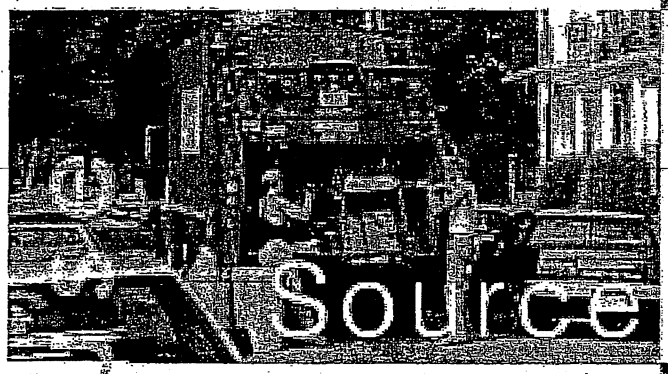
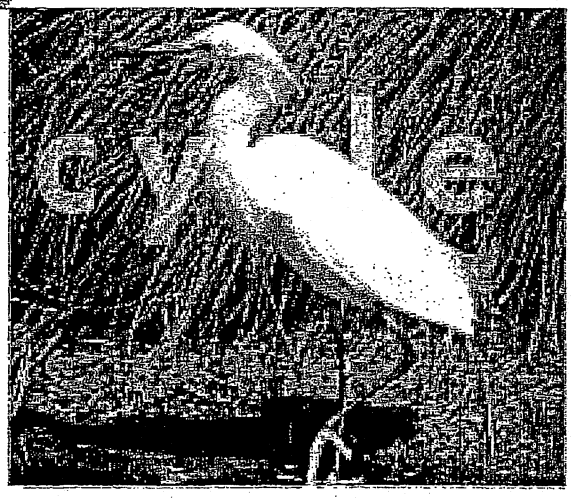
Municipal Solid Waste in The United States: 2001 Facts and Figures Executive Summary

Generation





Source Reduction



Disposal

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MUNICIPAL SOLID WASTE IN THE UNITED STATES: 2001 FACTS AND FIGURES

EXECUTIVE SUMMARY

OVERVIEW

This report describes the national municipal solid waste (MSW) stream based on data collected for 1960 through 2001. The historical perspective is useful for establishing trends in types of MSW generated and in the ways it is managed. In this Executive Summary, we briefly describe the methodology used to characterize MSW in the United States and provide the latest facts and figures on MSW generation, recycling, and disposal.

In the United States, we generated approximately 229.2 million tons of MSW in 2001—a decrease of 2.8 million tons from 2000. This is a decrease of 1.2 percent from 2000 to 2001. Excluding composting, the amount of MSW recovered for recycling increased to 51.4 million tons, an increase of 0.2 million tons from 2000. This is a 0.4 percent increase in the tons recycled. The tons recovered for composting rose slightly to 16.6 million tons in 2001, up from 16.5 million tons in 2000. The recovery rate for recycling (including composting) was 29.7 percent in 2001, up from 29.2 percent in 2000.[1] (See Tables ES-1 and ES-2 and Figures ES-1 and ES-2.)

MSW generation in 2001 declined to 4.4 pounds per person per day. This is a decrease of 2.2 percent from 2000 to 2001. The recycling rate in 2001 was 1.3 pounds per person per day. Discards after recycling declined to 3.1 pounds per person per day in 2001 (Table ES-3).

[1] Data shown for 2000 have been adjusted to reflect the latest revisions and, therefore, may differ from the same measure reported previously. For example, the percentage of MSW recovered for recycling has been revised downward from 30.1 percent to 29.2 percent.

Table ES-1
GENERATION, MATERIALS RECOVERY, COMPOSTING, AND DISCARDS OF MUNICIPAL SOLID WASTE, 1960 – 2001
(In millions of tons)

Millions of tons								
	1960	1970	1980	1990	1995	1999	2000	2001
Generation	88.1	121.1	151.6	205.2	213.7	231.4	232.0	229.2
Recovery for recycling	5.6	8.0	14.5	29.0	46.2	50.8	51.2	51.4
Recovery for composting*	Neg.	Neg.	Neg.	4.2	9.6	14.7	16.5	16.6
Total Materials Recovery	5.6	8.0	14.5	33.2	55.8	65.5	67.7	68.0
Discards after Recovery	82.5	113.0	137.1	172.0	158.0	165.9	164.3	161.2

* Composting of yard trimmings, food scraps and other MSW organic material.
Does not include backyard composting.
Details may not add to totals due to rounding.
Source: Franklin Associates, Ltd.

Table ES-2
GENERATION, MATERIALS RECOVERY, COMPOSTING, AND DISCARDS OF MUNICIPAL SOLID WASTE, 1960 – 2001
(In percent of total generation)

Percent of total generation								
	1960	1970	1980	1990	1995	1999	2000	2001
Generation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Recovery for recycling	6.4%	6.6%	9.6%	14.2%	21.6%	22.0%	22.1%	22.4%
Recovery for composting*	Neg.	Neg.	Neg.	2.0%	4.5%	6.4%	7.1%	7.2%
Total Materials Recovery	6.4%	6.6%	9.6%	16.2%	26.1%	28.4%	29.2%	29.7%
Discards after Recovery	93.6%	93.4%	90.4%	83.8%	73.9%	71.6%	70.8%	70.3%

* Composting of yard trimmings, food scraps and other MSW organic material.
Does not include backyard composting.
Details may not add to totals due to rounding.
Source: Franklin Associates, Ltd.

Figure ES-1: MSW Generation Rates from 1960to 2001

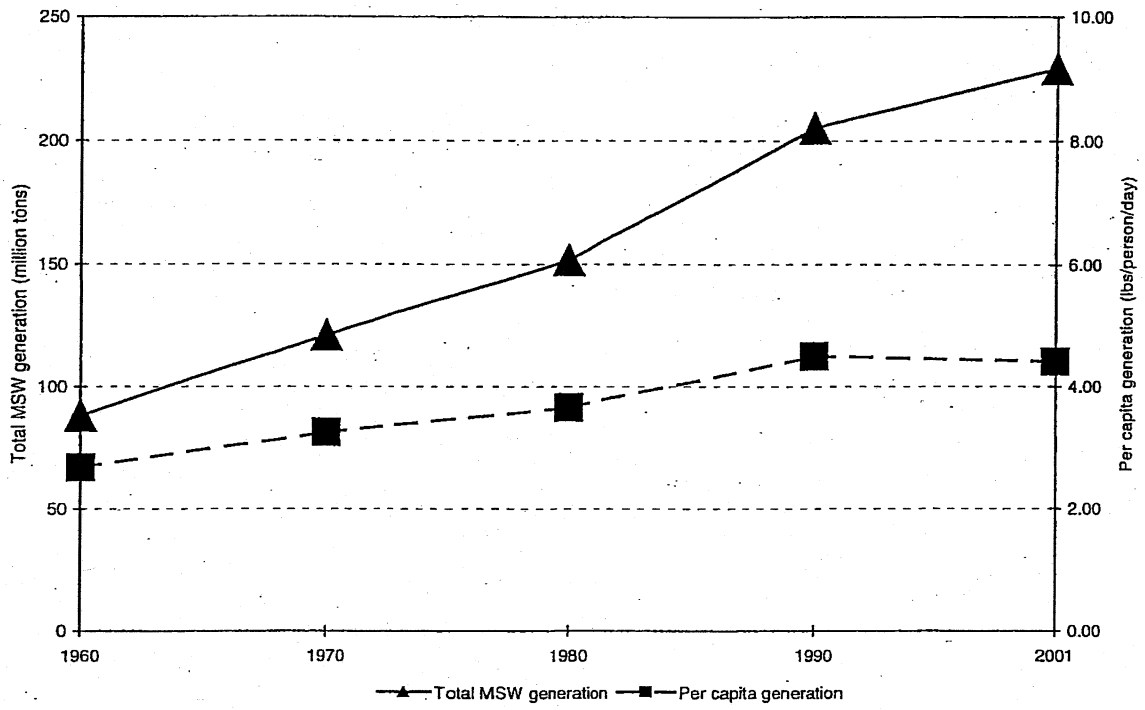


Figure ES-2: MSW Recycling Rates from 1960 to 2001

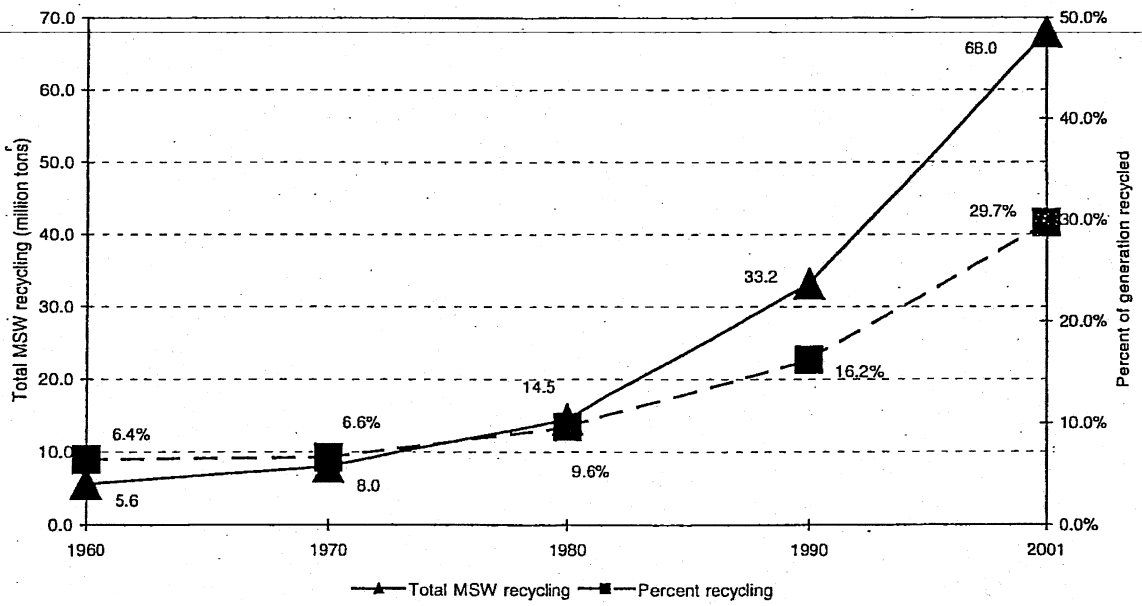


Table ES-3
GENERATION, MATERIALS RECOVERY, COMPOSTING AND DISCARDS OF MUNICIPAL SOLID WASTE, 1960 – 2001
(In pounds per person per day)

	Pounds per person per day							
	1960	1970	1980	1990	1995	1999	2000	2001
Generation	2.68	3.25	3.66	4.50	4.45	4.65	4.52	4.41
Recovery for recycling	0.17	0.22	0.35	0.64	0.96	1.02	1.00	0.99
Recovery for composting*	Neg.	Neg.	Neg.	0.09	0.20	0.30	0.32	0.32
Total Materials Recovery	0.17	0.22	0.35	0.73	1.16	1.32	1.32	1.31
Discards after Recovery	2.51	3.03	3.31	3.77	3.29	3.32	3.20	3.10
Population (millions)	179.979	203.984	227.255	249.907	263.168	272.691	281.422	284.797

* Composting of yard trimmings, food scraps and other MSW organic material.
Does not include backyard composting.
Details may not add to totals due to rounding.
Source: Franklin Associates, Ltd.

The state of the economy has a strong impact on consumption and waste generation. Waste generation continued to increase through the 1990s as economic growth continued to be strong. Between 1999 and 2000, total MSW generation increased only slightly. Between 2000 and 2001 total MSW generation decreased 1.2 percent, and this can be attributed, to a great extent, to a decline in production of paper and paperboard of 5.7 percent.

(Paper industry production is very sensitive to economic factors, and 2001 was not a good year for the industry.) At the same time, recovery of products (including paper and paperboard) increased slightly in 2001, and therefore a recycling rate of 29.7 percent was achieved in spite of the slowdown in the economy. The paper and paperboard recovery, as a percent of generation, increased from 42.3 percent to 44.9 percent in 2001. Export markets continued to play a major role in paper and paperboard recovery.

WHAT IS INCLUDED IN MUNICIPAL SOLID WASTE?

MSW—otherwise known as trash or garbage—consists of everyday items such as product packaging, grass clippings, furniture, clothing, bottles, food scraps, newspapers, appliances, and batteries. Not included are materials that also may be disposed in landfills, but are not generally considered MSW, such as construction and demolition debris, municipal wastewater treatment sludges, and non-hazardous industrial wastes.

MUNICIPAL SOLID WASTE IN PERSPECTIVE

Trends Over Time

Over the last few decades, the generation, recycling, and disposal of MSW have changed substantially (see Tables ES-1, ES-2, and ES-3 and Figures ES-1 and ES-2). MSW generation has continued to increase from 1960, when it was 88 million tons. The generation rate in 1960 was just 2.7 pounds per person per day; it grew to 3.7 pounds per person per day in 1980; reached 4.5 pounds per person per day in 1990; and it stabilized at 4.4 pounds per person per day in 2001 after increasing through the 1990s.

Over time, recycling rates have increased from 10 percent of MSW generated in 1980 to 16 percent in 1990, to 29.7 percent in 2001. Disposal has decreased from 90 percent of the amount generated in 1980 to 70 percent of MSW in 2001. This compares to 71 percent in 2000.

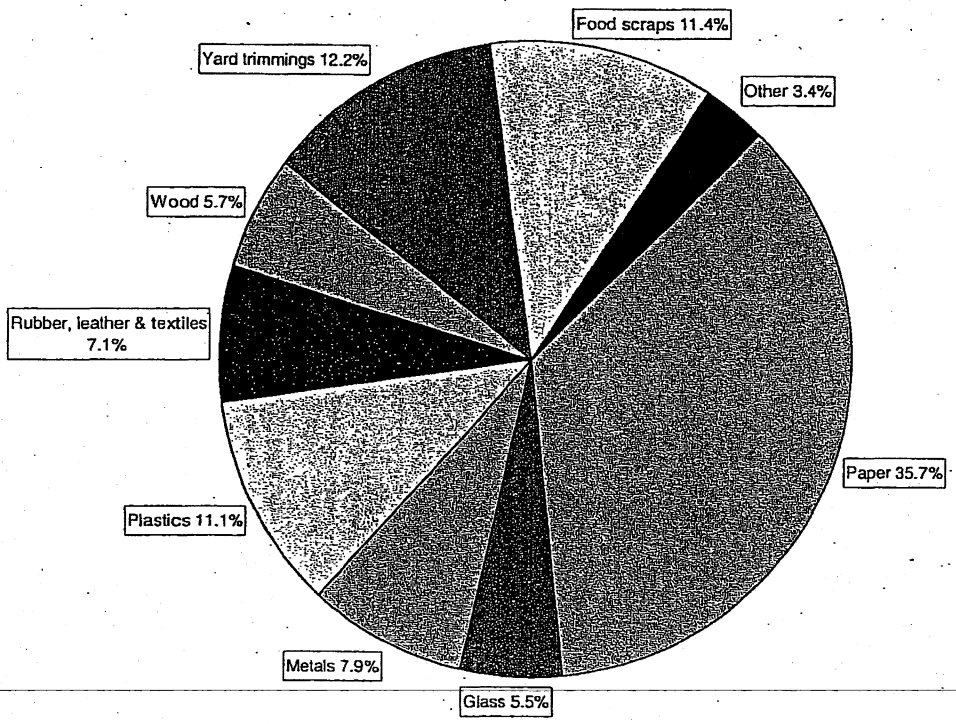
MUNICIPAL SOLID WASTE IN 2001

The U.S. Environmental Protection Agency (EPA) has two ways of analyzing the 229.2 million tons of MSW generated in 2001. The first is by **material** (paper and paperboard, yard trimmings, food scraps, plastics, metals, glass, wood, rubber, leather and textiles, and other); the second is by several major **product** categories. The product-based categories are containers and packaging; nondurable goods (e.g., newspapers) durable goods (e.g., appliances); food scraps; and other materials.

Materials in MSW

A breakdown, by weight, of the MSW **materials** generated in 2001 is provided in Figure ES-3. Paper and paperboard products made up the largest component of MSW generated (36 percent), and yard trimmings comprised the second-largest component (12 percent). Glass, metals, plastics, wood, and food scraps each constituted between 5 and 12 percent of the total MSW generated. Rubber, leather, and textiles combined made up about 7 percent of MSW, while other miscellaneous wastes made up approximately 3 percent of the MSW generated in 2001.

Figure ES-3: 2001 Total MSW Generation – 229 Million Tons (Before Recycling)



A portion of each material category in MSW was recycled or composted in 2001. The highest rates of recovery were achieved with yard trimmings, paper products, and metal products. About 57 percent (15.8 million tons) of yard trimmings were recovered for composting in 2001. This represents nearly a four-fold increase since 1990. About 45 percent (36.7 million tons) of paper and paperboard were recovered for recycling in 2001. Recycling these organic materials alone diverted nearly 23 percent of municipal solid waste from landfills and combustion facilities. In addition, about 6.3 million tons, or about 35 percent, of metals were recovered for recycling. Recycling rates for all materials categories in 2001 are listed in Table ES-4.

Table ES-4
GENERATION AND RECOVERY OF MATERIALS IN MSW, 2001
(In millions of tons and percent of generation of each material)

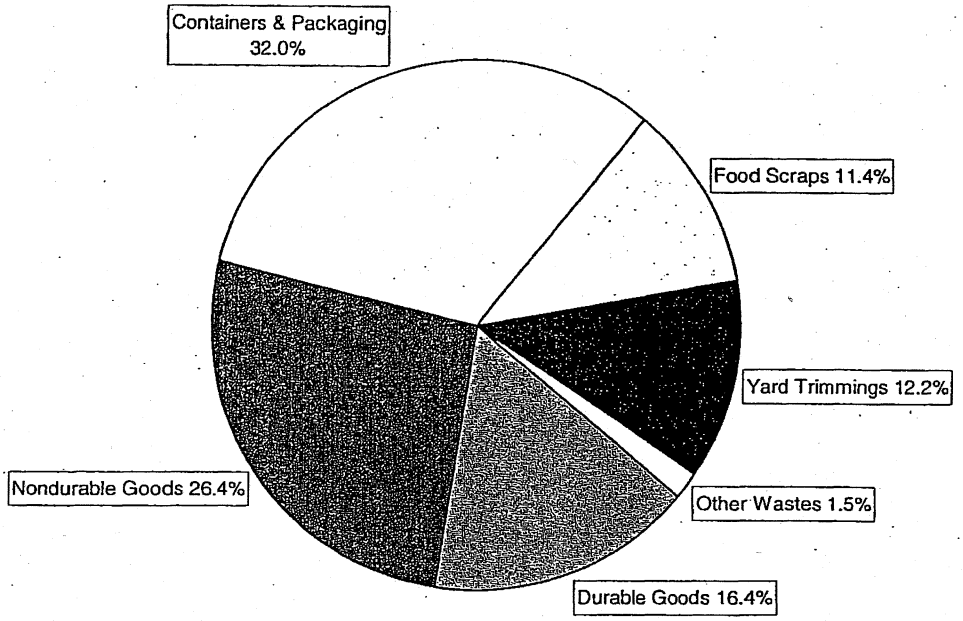
	Weight Generated	Weight Recovered	Recovery as a Percent of Generation
Paper and paperboard	81.9	36.7	44.9%
Glass	12.6	2.4	19.1%
Metals			
Steel	13.5	4.6	33.8%
Aluminum	3.2	0.8	24.5%
Other nonferrous metals*	1.4	0.9	64.8%
Total metals	18.1	6.3	34.5%
Plastics	25.4	1.4	5.5%
Rubber and leather	6.5	1.1	17.4%
Textiles	9.8	1.4	14.6%
Wood	13.2	1.3	9.5%
Other materials	4.2	0.9	20.7%
Total Materials in Products	171.5	51.4	30.0%
Other wastes			
Food, other**	26.2	0.7	2.8%
Yard trimmings	28.0	15.8	56.5%
Miscellaneous inorganic wastes	3.5	Neg.	Neg.
Total Other Wastes	57.7	16.6	28.7%
TOTAL MUNICIPAL SOLID WASTE	229.2	68.0	29.7%

Includes waste from residential, commercial, and institutional sources.
* Includes lead from lead-acid batteries.
** Includes recovery of other MSW organics for composting.
Neg. = Less than 5,000 tons or 0.05 percent.
Source: Franklin Associates, Ltd.

Products in MSW

The breakdown, by weight, of **product categories** generated in 2001 is shown in Figure ES-4. Containers and packaging comprised the largest portion of products generated, at 32.0 percent (74 million tons) of total MSW generation. Nondurable goods were the second-largest fraction, comprising 26.4 percent (60 million tons). The third-largest category of products is durable goods, which comprised 16.4 percent (38 million tons) of total MSW generation.

Figure ES-4: Products Generated in MSW – 2001
(Total Weight = 229 million tons)



The generation and recovery of the product categories in MSW in 2001 are shown in Table ES-5. This table shows that recovery of containers and packaging was the highest of the three product categories—38 percent of containers and packaging generated in 2001 were recovered for recycling. About 49 percent of all aluminum cans were recovered (40 percent of all aluminum packaging, including foil), while 59 percent of steel packaging (mostly cans) was recovered. Paper and paperboard containers and packaging were recovered at a rate of 55 percent; corrugated containers accounted for most of that amount.

Approximately 22 percent of glass containers were recovered, while about 15 percent of wood packaging (mostly wood pallets re-moved from service) was recovered for recycling. About 10 percent of plastic containers and packaging were recovered, mostly soft drink, milk, and water bottles.

Table ES-5
GENERATION AND RECOVERY OF PRODUCTS IN MSW BY MATERIAL, 2001
(In millions of tons and percent of generation of each product)

	Weight Generated	Weight Recovered	Recovery as a Percent of Generation
Durable Goods			
Steel	10.9	3.0	27.8%
Aluminum	1.0	Neg.	Neg.
Other non-ferrous metals*	1.4	0.9	64.8%
Total metals	13.3	4.0	29.6%
Glass	1.7	Neg.	Neg.
Plastics	8.0	0.3	3.9%
Rubber and leather	5.6	1.1	20.1%
Wood	5.0	Neg.	Neg.
Textiles	2.9	0.3	11.8%
Other materials	1.2	0.9	73.7%
Total durable goods	37.6	6.6	17.5%
Nondurable Goods			
Paper and paperboard	43.5	15.6	35.9%
Plastics	6.1	Neg.	Neg.
Rubber and leather	0.9	Neg.	Neg.
Textiles	6.7	1.1	16.1%
Other materials	3.2	Neg.	Neg.
Total nondurable goods	60.4	16.7	27.7%
Containers and Packaging			
Steel	2.6	1.5	58.8%
Aluminum	2.0	0.8	40.0%
Total metals	4.6	2.3	50.8%
Glass	10.9	2.4	22.0%
Paper and paperboard	38.4	21.1	55.0%
Plastics	11.2	1.1	9.6%
Wood	8.2	1.3	15.2%
Other materials	0.2	Neg.	Neg.
Total containers and packaging	73.5	28.1	38.3%
Other wastes			
Food, other**	26.2	0.7	2.8%
Yard trimmings	28.0	15.8	56.5%
Miscellaneous inorganic wastes	3.5	Neg.	Neg.
Total Other Wastes	57.7	16.5	28.7%
TOTAL MUNICIPAL SOLID WASTE	229.2	68.0	29.7%

Includes waste from residential, commercial, and institutional sources.

* Includes lead from lead-acid batteries.

** Includes recovery of other MSW organics for composting.

Details may not add to totals due to rounding.

Neg. = Less than 5,000 tons or 0.05 percent.

Source: Franklin Associates, Ltd.

Overall recovery of *nondurable goods* was 27.7 percent in 2001. Most of this recovery comes from paper products such as newspapers and high-grade office papers (e.g., white papers). Newspapers constituted the largest portion of this recovery, with 60 percent of newspapers generated being recovered for recycling. An estimated 55 percent of high-grade office papers and 32 percent of magazines were recovered in 2001. Newspaper and high-grade office paper recovery increased in percentage between 2000 and 2001. Magazine recovery remained the same.

Recovery percentage of other commercial printing increased to 22 percent. The other paper products in the nondurable goods category decreased slightly between 2000 and 2001, with Standard (A) mail* recovered at an estimated 32 percent, and directories at an estimated 15 percent.

The nondurable goods category also includes clothing and other textile products—14 percent of these products were recovered for recycling or export in 2001.

Overall, *durable goods* were recovered at a rate of 17.5 percent in 2001. Nonferrous metals other than aluminum had one of the highest recovery rates, at 65 percent, due to the high rate of lead recovery from lead-acid batteries. Recovery of steel in all durable goods was 27.8 percent, with high rates of recovery from appliances and other miscellaneous durable goods. Thirty-nine percent of rubber in tires was recovered for recycling. (Other tires were retreaded and shredded rubber tires were made into tire-derived fuel.)

One of the products with a very high recovery rate was lead-acid batteries, recovered at a rate of 93.5 percent in 2001. Other products with particularly high recovery rates were steel from major appliances (73.9 percent), corrugated boxes (70.1 percent), newspapers (60.2 percent), steel cans (58.1 percent), and aluminum cans (49.0 percent).

RESIDENTIAL AND COMMERCIAL SOURCES OF MSW

Sources of MSW, as characterized in this report, include both residential and commercial locations. We estimated residential waste (including waste from multi-family dwellings) to be 55

[2] Standard (A) mail was formerly called Third Class mail by the U.S. Postal Service.

to 65 percent of total MSW generation. Commercial waste (including waste from schools, some industrial sites where packaging is generated, and businesses) constitutes between 35 and 45 percent of MSW. Local and regional factors, such as climate and level of commercial activity, contribute to these variations.

MANAGEMENT OF MSW

Overview

EPA's integrated waste management hierarchy includes the following three components, listed in order of preference:

- Source reduction (or waste prevention), including reuse of products and onsite, or backyard, composting of yard trimmings.
- Recycling, including offsite, or community, composting.
- Disposal, including waste combustion (preferably with energy recovery) and landfilling.

Although EPA encourages the use of strategies that emphasize the top of the hierarchy whenever possible, all three components remain important within an integrated waste management system.

Source Reduction

When EPA established its waste management hierarchy in 1989, it emphasized the importance of *reducing* the amount of waste created, reusing whenever possible, and then recycling what is left. When municipal solid waste is reduced and reused, this is called "source reduction"—meaning the material never enters the waste stream. Instead it is managed at the source of generation.

Source reduction, also called waste prevention, includes the design, manufacture, purchase, or use of materials, such as products and packaging, to reduce their amount or toxicity before they enter the MSW management system. Examples of source reduction activities are:

- Designing products or packaging to reduce the quantity or the toxicity of the materials used, or to make them easy to reuse.
- Reusing existing products or packaging; for example, refillable bottles, reusable pallets, and reconditioned barrels and drums.
- Lengthening the lives of products such as tires as fewer need to be produced and therefore disposed of.
- Using packaging that reduces the amount of damage or spoilage to the product.
- Managing nonproduct organic wastes (e.g., food scraps, yard trimmings) through onsite composting or other alternatives to disposal (e.g., leaving grass clippings on the lawn).

As the nation has begun to realize the value of its resources, both financial and material, efforts to reduce waste generation have increased. EPA has been able to estimate source reduction for the nation based on economic and waste data. Table ES-6 shows that steady progress was made in waste prevention since 1990. In 2000, the United States prevented more than *55 million tons* of municipal solid waste from entering the waste stream (using a 1990 baseline).

Table ES-6
SOURCE REDUCTION OF MUNICIPAL SOLID WASTE SINCE 1990
(In millions of tons)

Year	Million Tons Source Reduced
1992	0.6
1994	8.0
1995	21.4
1996	31.0
1997	31.8
1998	37.3
1999	42.8
2000	55.1

* Source reduction estimates for 2001 are not included in this report. The impact to the 2001 MSW waste generation is expected to be similar to 2000.

The waste prevention achieved to date comes from all parts of the waste stream. However, reducing the amount of yard trimmings is a particularly important source reduction success story. Table ES-7 shows that almost half of the waste prevented in 2000 came from organic waste materials, particularly yard trimmings. This is likely the result of many locally enacted bans on the disposal of yard trimmings from landfills around the country, as well as successful campaigns promoting onsite composting and the use of mulching lawn mowers.

Table ES-7
SOURCE REDUCTION BY MAJOR MATERIAL CATEGORIES, 2000
(In millions of tons)

Waste Stream	Million Tons Source Reduced
Durable Goods (e.g., appliances, furniture)	5.4
Nondurable Goods (e.g., newspapers, clothing)	9.3
Containers & Packaging (e.g., bottles, boxes)	15.5
Other MSW (e.g., yard trimmings, food scraps)	25.0
Total Source Reduction (1990 baseline)	55.1

Prevention of waste other than yard trimmings has been important as well. Containers and packaging represent approximately 28 percent of the materials source reduced in 2000, in addition to nondurable goods (e.g., newspapers, clothing) at 17 percent, durable goods (e.g., appliances, furniture, tires) at 10 percent, and other MSW (e.g., yard trimmings, food scraps) at 45 percent.

Much of the nation's increase in waste generation in the 1990s was due to the booming economy. As a group, Americans spent more, recycled more, and disposed more. However, the United States made progress in the area of waste reduction and reuse, as indicated by the 55 million tons of source reduction in 2000, the latest year for which we have estimates available. Had this source reduction not occurred, waste generation in 2000 would have risen from the actual level, 232 million tons, to 287 million tons. Source reduction avoided an increase of nearly 25 percent.

Recycling

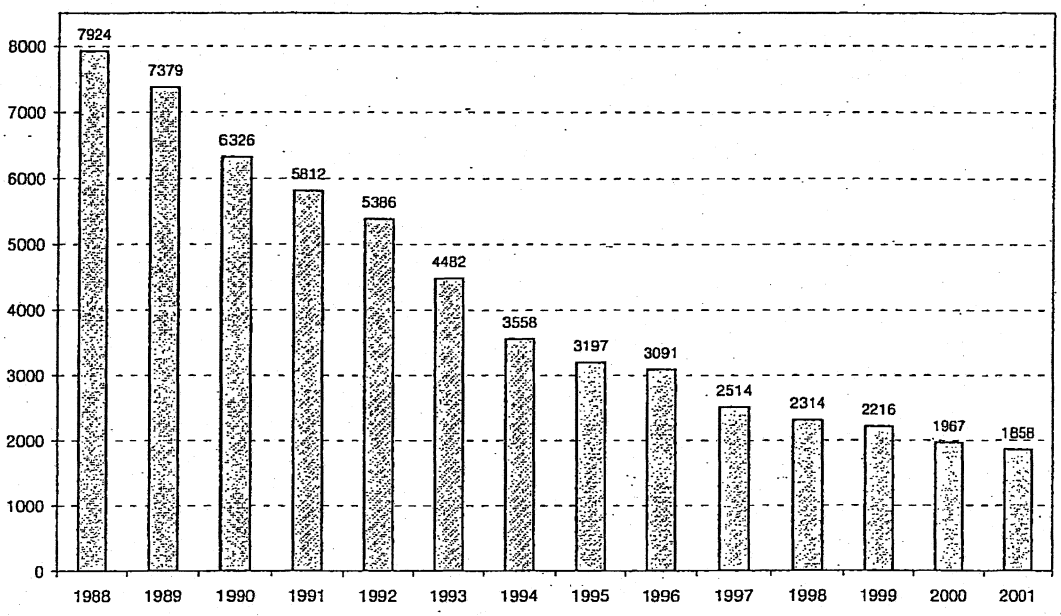
- Recycling (including community composting) recovered 30 percent (68 million tons) of MSW in 2001.
- There were about 9,700 curbside recycling programs in the United States in 2001. This is approximately 5 percent more than the 9,250 curbside recycling programs identified in 2000. Much of this increase was in the western United States.
- About 3,800 yard trimmings composting programs were reported in 2001.

Disposal

An estimated 14.7 percent of MSW was combusted in 2001, slightly higher than the 14.5 percent estimated in 2000. During 2001, about 55.7 percent of MSW was landfilled, down somewhat from 56.3 percent in 2000. As shown in Figure ES-5, the number of municipal solid waste landfills decreased substantially over the past 10 years, from nearly 8,000 in 1988 to 1,858 in 2001—while average landfill size increased. At the national level, capacity does not appear to be a problem, although regional dislocations sometimes occur.

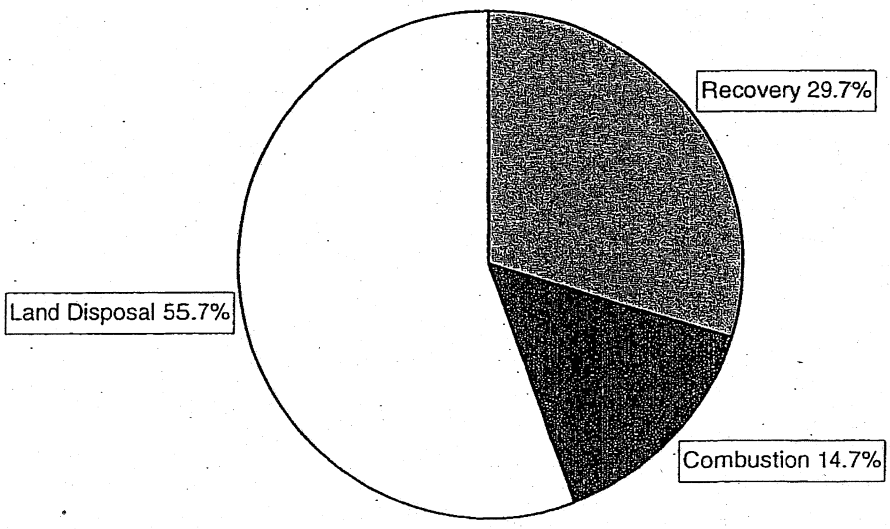
- The percentage of MSW landfilled decreased slightly from 2000 to 2001. Over the long term, the tonnage of MSW landfilled in 1990 was 140.1 million tons, but decreased to 122.4 million tons in 1995. The tonnage increased to 131.8 million tons in 1999, then declined to 127.6 in 2001. The tonnage landfilled results from an interaction among generation, recycling, and combustion, which do not necessarily rise and fall at the same time.
- The net per capita discard rate (after recovery for recycling, including composting) was 3.10 pounds per person per day, down from 3.20 pounds per person per day in 2000 (Table ES-3).

Figure ES-5: Number of Landfills in the U.S.



MSW recovered for recycling (including composting) and disposed of by combustion and landfilling in 2001 is shown in Figure ES-6. In 2001, 68.0 millions tons (29.7 percent) of MSW were recycled, 33.6 million tons (14.7 percent) were combusted, and 127.6 million tons (55.7 percent) were landfilled or otherwise disposed. (Relatively small amounts of this total undoubtedly were littered or illegally dumped rather than landfilled.)

Figure ES-6: Management of MSW in the U.S. - 2001



PERSPECTIVE FOR THE NATION

As economic growth results in more products and materials being generated, there will be an increased need to invest in source reduction activities such as lightweighting of products and packaging, reuse of products, grasscycling, and backyard composting. Also important will be utilizing existing recycling and composting facilities, further developing this infrastructure, and buying recycled products, to conserve resources and minimize our dependence on disposal through combustion and landfilling.

FOR FURTHER INFORMATION

This report and related additional data are available on the Internet at <www.epa.gov/osw>. Additional information on source reduction is available in *National Source Reduction Characterization Report for Municipal Solid Waste in the United States*, EPA530-R-99-034, November 1999.

EPA
United States Environmental Protection Agency
1200 Pennsylvania Avenue, NW.
(5305W)
Washington, DC 20460